

What is claimed is:

1        1. A method for coating an implant comprising the  
2 steps of

3                (a) contacting the implant with an aqueous  
4 solution of magnesium, calcium, and phosphate ions;

5                (b) passing a gaseous weak acid through the  
6 aqueous solution;

7                (c) degassing the aqueous solution; and

8                (d) allowing the magnesium, calcium, and  
9 phosphate ions to precipitate onto the implant to form a  
10 coating.

1        2. The method of claim 1 wherein the gaseous weak  
2 acid is carbon dioxide.

1        3. The method of claim 1 wherein the implant is  
2 formed from one or more of metal, organic material, polymer  
3 or ceramic.

1        4. The method according to claim 1 wherein the  
2 calcium and phosphate ions are present in the aqueous  
3 solution in a molar ratio of between about 1 to about 3.

1        5. The method according to claim 1 wherein the  
2 calcium and phosphate ions are present in the aqueous  
3 solution in a molar ratio of between about 1.5 to about  
4 2.5.

1        6. The method according to claim 1 wherein the  
2 aqueous solution comprises about 0.5 to about 50 mM calcium  
3 ions and about 0.5 to about 20 mM phosphate ions.

4        7. The method according to claim 1 wherein the  
5 aqueous solution comprises about 2.5 to about 25 mM calcium  
6 ions and about 1.0 to about 10 mM phosphate ions.

1       8. The method according to claim 1 wherein the  
2 aqueous solution comprises about 0.1 to about 20 mM  
3 magnesium ions.

1       9. The method according to claim 1 wherein the  
2 aqueous solution comprises about 1.5 to about 10 mM  
3 magnesium ions.

1       10. The method according to claim 1 wherein the  
2 aqueous solution comprises no carbonate ions or less than  
3 about 50 mM carbonate ions.

1       11. The method according to claim 1 wherein the  
2 aqueous solution comprises no carbonate ions or less than  
3 about 42 mM carbonate ions.

1       12. The method according to claim 1 wherein the  
2 aqueous solution comprises an ionic strength in the range  
3 of about 0.1 to about 2 M.

1       13. The method according to claim 1 wherein the  
2 aqueous solution comprises an ionic strength in the range  
3 of about 0.15 to about 1.5 M.

1       14. The method according to claim 1 wherein the  
2 gaseous weak acid is passed through the aqueous solution at  
3 a pressure of about 0.1 to about 10 bar.

1       15. The method according to claim 1 wherein the  
2 gaseous weak acid is passed through the aqueous solution at  
3 a pressure of about 0.5 to about 1.5 bar.

1       16. The method according to claim 1 wherein the  
2 aqueous solution has a temperature in the range of between  
3 about 5°C to about 80°C.

1        17. The method according to claim 1 wherein the  
2 aqueous solution has a temperature in the range of between  
3 about 5°C to about 50°C.

1        18. The method according to claim 1 wherein the  
2 implant is treated by a mechanical or chemical surface  
3 treatment prior to contacting the implant with the aqueous  
4 solution.

1        19. The method of claim 18 wherein the implant is  
2 treated by sand-blasting, scoring, polishing or grounding.

1        20. The method of claim 18 wherein the implant is  
2 treated by contacting with strong mineral acid or an  
3 oxidizing agent in a manner to etch the implant.

1        21. The method of claim 1 wherein the coating  
2 comprises magnesium ions, calcium ions and phosphate ions  
3 and one or more ions selected from the group consisting of  
4 hydroxide, carbonate, chloride, sodium and potassium.

1        22. The method of claim 1 wherein the coating  
2 comprises one or more of amorphous carbonate calcium  
3 phosphate, hydroxyapatite, calcium deficient and hydroxyl  
4 carbonate apatite, octacalcium phosphate, dicalcium  
5 phosphate dihydrate or calcium carbonate.

1        23. The method of claim 1 wherein the coating has a  
2 thickness of about 0.5 to about 100 microns.

1        24. The method of claim 1 wherein the coating has a  
2 thickness of about 0.5 to about 50 microns.

1           25. The method of claim 1 further comprising the step  
2           of contacting a coated implant with a calcifying solution  
3           comprising calcium and phosphate ions, and allowing a  
4           precipitate layer of calcium and phosphate ions to form on  
5           the coated implant.

1           26. A device for coating an implant comprising  
2           (a) reactor vessel;  
3           (b) heating element operatively connected to the  
4           reactor vessel;  
5           (c) implant support;  
6           (d) stirrer disposed within the reactor vessel;  
7           (f) inlet and outlet operatively connected to  
8           the reactor vessel; and  
9           (g) controlled source of carbon dioxide  
10           operatively connected to the inlet.